2004 ANNUAL REPORT

PARKER MOUNTAIN ADAPTIVE RESOURCE MANAGEMENT PLAN

Cooperators

Parker Mountain Grazing Association
U. S. Bureau of Land Management
U. S. Fish and Wildlife Service
U. S. Forest Service
U.S.D.A. Farm Services Agency
U.S.D.A. Natural Resource Conservation Agency
U.S.D.A. Wildlife Services
Utah Agricultural Experiment Station
Utah Department of Agriculture and Food
Utah Department of Natural Resources
Utah Division of Wildlife Resources
Utah Farm Bureau Federation
Utah School and Institutional Trustlands Administration
Utah State University Vice President for Research
Utah State University, Vice President for Extension
Wayne and Piute County Commissions

Prepared by

David Dahlgren, Dwayne Elmore, and Terry Messmer
Quinney Professorship for Wildlife Conflict Management
Jack H. Berryman Institute
Utah State University, Logan

Verl Bagley
Utah State University Extension Service
Wayne and Piute County Extension Office

January 2005

Table of Contents

Page

EXECUTIVE SUMMARY

The Parker Mountain Adaptive Resource Management (PARM) Working Group began meeting in 1998. PARM was organized to assist local communities in Wayne and Piute Counties to address Greater Sage-grouse conservation and local socio-economic issues. The group has focused its efforts on restoring rangeland vegetation diversity on Parker Mountain. PARM believes these efforts will benefit both local communities and Greater Sage-grouse populations. Currently, Greater Sage-grouse populations on Parker Mountain appear increasing. In 2004 lek counts were 541, close to the 2002 maximum of 594 male sage-grouse. PARM members assisted in lek counts in 2004. This is the first year that male Greater-Sage-grouse were documented on leks which had been historically dormant. These data were not included in the overall lek counts. Only leks that were previously active were included for annual comparisons. .

In 2004 seasonal movements of 9 radio collared hens were monitored. No additional captures of Greater Sage-grouse hens were conducted. Of these hens only one mortality was recorded. This bird was harvested during the hunt. Five of the 9 hens nested. Although the remaining 4 birds may have initiated nests, we were unable to locate an active nest. Nest initiation occurred throughout May.

One of the 5 nests was predated in 2004. The clutch sizes ranged from 6 to 8 eggs. Nest success (at least one egg hatched) in 2004 was 80%. This is high compared to other study areas in Greater sage-grouse range, though sample size was low.

Brood-rearing began in late May to early June and continued throughout the summer. Two of the 4 broods were still active after 6 weeks.. One hen lost her brood shortly after hatching, and the other hen’s collar failed. In 2004, hen movements from lek to nest sites to brood-rearing areas were inconsistent. . Some hens moved long distances while others stayed close to lek sites.

Experimental Treatments

In October 2000, four-100 acres plots were treated with tebuthiuron. In 2004, the vegetation response of plots to the tebuthiuron (Spike) treatments was dramatic. The vegetation measurements recorded in 2001 indicated no differences in cover types or vegetation diversity between the treated and non-treated sites. The continued drought in 2001 coupled with the delayed effects of tebuthiuron probably contributed to this response. Although in 2002 (another exceptionally dry year) there was a significant forb response measured on the spike treatment plots. Given the extremely dry weather conditions in 2002, the response of the forbs proved critical for broods in the area. The grasses declined in abundance on both the control and the treatment plots. In 2003, forb and grass diversity was again height on the treatment plots.

In October 2001, four-100 acre plots were treated using the Dixie harrow. Another four 100 acre plots were treated with the Lawson aerator. These plots exhibited greater vegetation diversity than the control plots.

In 2003 and 2004, we used bird dog flush counts and pellet counts to assess Greater Sage-grouse use within treatment plots. Spike treatments exhibited the highest sage-grouse use for both bird dog surveys and pellet counts. All three treatments exhibited higher use than the control in both surveys and years.

In 2002, we were concerned about the potential impacts rabbits might be having on vegetation response in the study area. To monitor this effect on Parker Lake pasture, we placed additional rabbit-proof exclosures adjacent to the large herbivore exclosures. We measured the vegetation in both sets of exclosures. The exclosures showed that rabbits were impacting grasses and forbs in certain plots. This research has provided important documentation regarding the impacts that high density rabbit populations may have on forage diversity and production in treatment areas..

Summary of 2004 Research Activities

Sage-grouse Biology

Sage-grouse Hen Captures

No hens were captured in 2004. Nine of the radio transmitters of hens captured in previous years were still active in 2004. (Give a breakdown, estimate on the possible age of these birds. This could be some very significant data that further documents a low predation rates on adult birds.

Sage-grouse Lek Counts

Lek counts began in March and continued through April. Lek counts were higher compared to past years but slightly below the highest count on Parker Mountain in 2002. A total of 541 males were counted in 2004 on leks that were annually counted (Figure 1).. PARM members were able to assist census efforts on Parker Mountain in 2004. As the teams searched the area they recorded males displaying on historical leks which had been previously dormant. These males were not included in the lek trend data.

One day was set aside to count all leks on Parker Mountain in one morning. All leks were counted, including the historical leks. This count totaled over 600 displaying males. This is the largest number of displaying males ever counted on Parker Mountain since regular counts were initiated in 1967.

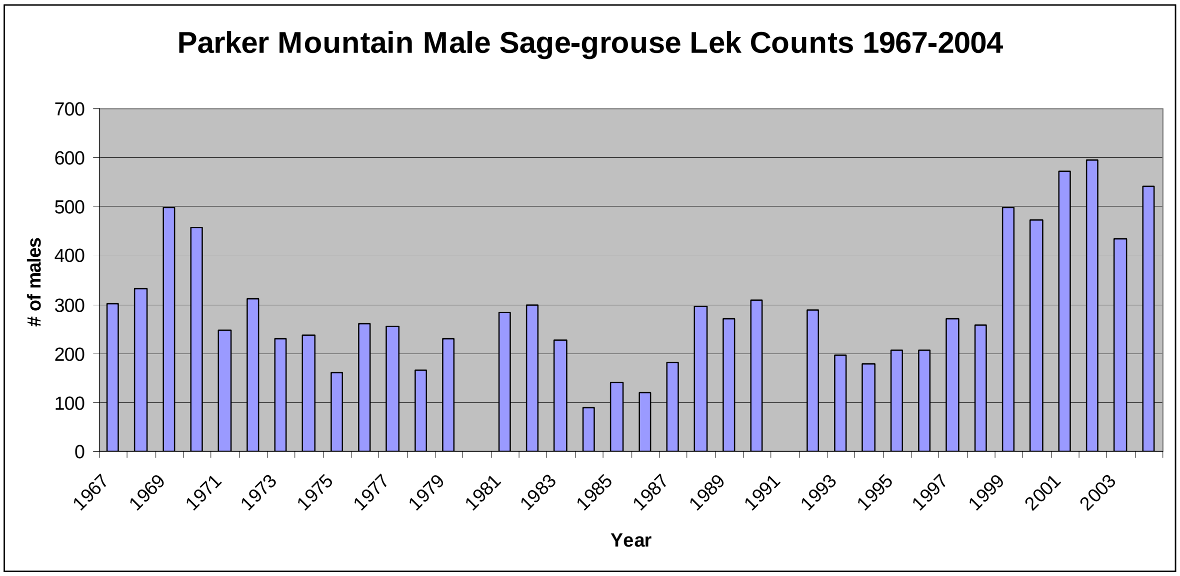

Figure 1. Historical lek counts trends of the Parker Mountain Sage-grouse Population

Monitoring Parker Mountain Sage-grouse Hens

From mid-May to August 2004, we monitored 9 sage-grouse hens (Table 1) to determine their seasonal habitat use patterns, nest and brood success, and chick and adult mortality. We identified and described the habitats used for nesting and brood-rearing.

Table 1. Sage-grouse hens listed by radio frequency

Freq	Nested	Hatched	Pred	clutch	brood survival	description of activity
333	Y	Y	N	6	?	collar died at time of hatch and we weren't able to follow her
893	Y	Y	N	?	N	She joined other adults, and was shot during the hunt
753	Y	N	Y/mam	?	n/a	She joined other adult birds
475	Y	Y	N	8	Y	She raised a brood in Grass Valley
834	Y	Y	N	7	Y	She nested and raised a brood in the Fishlake Triangle treatments
454	N	n/a	n/a	n/a	n/a	We never found her on a nest, though she acted like she had one in a certain area
272	N	n/a	n/a	n/a	n/a	We never found her on a nest, though she stayed around the area she nested in the two previous years, her collar failed in June
933	N	n/a	n/a	n/a	n/a	We never found her on a nest or acting like she was going to nest
773	N	n/a	n/a	n/a	n/a	She spent a lot of time in the area she nested the previous year, then left…we never found her on a nest

Nesting Activity

The radio-collared hens began nesting (incubation, ~28 days) throughout May. During May, 5 of the 9 collared hens (56%) had established nests (Table 1). One of the 5 nests was depredated (20%). We attributed this mortality to a mammalian predator, possibly a bobcat. Four (80%) of the remaining nests successfully hatched (Table 1). Clutch size varied between 6-8 eggs/nest.

Brood-rearing activity

Two broods were raised successfully (> 6 weeks old). One hen lost her brood shortly after hatching. The other hen's collar failed, and her brood's fate is unknown.

Throughout the summer hens with broods and hens without broods generally moved in a southerly or southeasterly direction on Parker Mountain. This direction coincided with an increasing elevational gradient (this pattern was similar to that previously documented over the last 6 years). Distances traveled by hens varied between approximately 5 to 15 miles.

Status of Adult Hens

Only one hen we monitored died during 2004. The hen was legally harvested during the hunting season. The status of the surviving birds will be again monitored in 2005.

Parker Lake Experimental Pasture

Based on work conducted by Joel Flory, the Parker Lake Pasture (PLP) was selected by the Parker Mountain Adaptive Resource Management (PARM) working group in early 2000 as the experimental pasture to evaluate the effect of several sagebrush management treatments on sage-grouse and vegetation diversity. Three sagebrush management treatments were implemented on the pasture to evaluate the effect of the treatments sagebrush canopy cover and vegetation diversity.

In the spring of 2000, 16 plots were mapped across the landscape encompassing the largest, thickest stands of big mountain sagebrush (*A. tridentata* ssp. *vaseyana*) and randomly assigned as treatments or controls. During the fall of 2000, four plots were aerially treated with tebuthiuron (Spike) at three-tenths pound/acre. The other Lawson aerator treatments and Dixie harrow treatments were delayed due to early snowfall on the site. The remaining plots were treated in October 2001. Four of the plots were Dixie harrowed and four were treated with the Lawson aerator. The aerator was provided by the Utah Division of Wildlife Resources (UDWR) The sites that were harrowed were reseeded with a specially designed UDWR seed mixture. Though, in post treatment data essentially none of the seed germinated.

During the summer of 2004, to stay consistent with the past 4 years, 3 types of vegetation sampling in the experimental plots (Control, Dixie Harrow, Lawson Aerator, and Tebuthiuron) were conducted. We conducted the point-intercept sampling and line-intercept sampling from GPS locations identified and used in the three previous years. From these points, a 20-meter tape was stretched out in the random direction chosen in 2000. The point-intercept sampling was conducted at each meter and the basal cover type recorded. This method was supplemented with a Daubenmire frame at every four meters to “double sample” and compare results. The line-intercept sampling was conducted to measure the canopy cover of the shrubs. Both of these methods were conducted in June and July, corresponding to early and late brood-rearing periods of time on Parker Mountain.

To measure the lagomorph utilization of the herbaceous understory vegetation, rabbit-proof exclosures were constructed in 2002 (Figure 2). We sampled the squares (open, closed to large ungulates, closed to large ungulates and lagomorphs) in the same way as the last 3 years. Basal percent cover was estimated with the Daubenmire frames (n=12) on a grid within each exclosure type. The vegetation in the exclosures was sampled once/month from June to September.

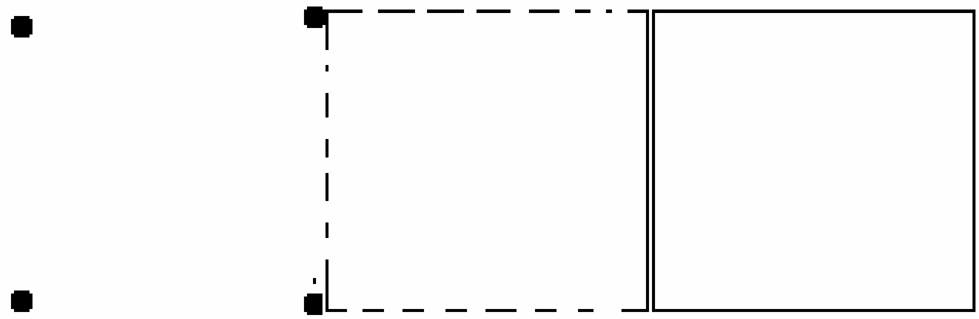

Figure 2. Exclosure sampling pattern: Open to everything, closed to large ungulates, closed to large ungulates and lagomorphs.

Tebuthiuron (Spike)

In tebuthiuron treatments there was no measurable response from the understory the first year post-treatment (2001). In the second year post-treatment (2002), the grasses did not respond, but the forbs in the tebuthiuron plots showed a significant response. Considering the extremely dry conditions of 2002, the forb response is particularly unexpected. The availability of forbs during such a dry year provided sage-grouse broods a nutritional source that might not have been available without the treatment. This may provide a valuable management tool to specifically improve sage-grouse brood habitat. In 2003 and 2004 the herbaceous response was dramatic when compared to controls (Figures 3 and 4).

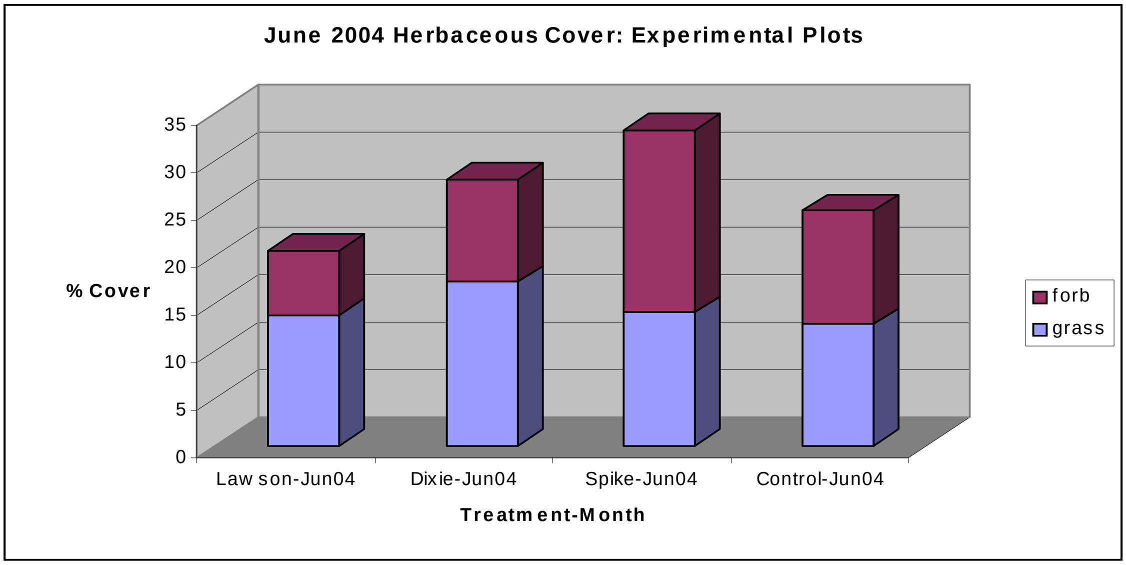

Figure 3. June 2004 herbaceous response in treatments was higher than controls.

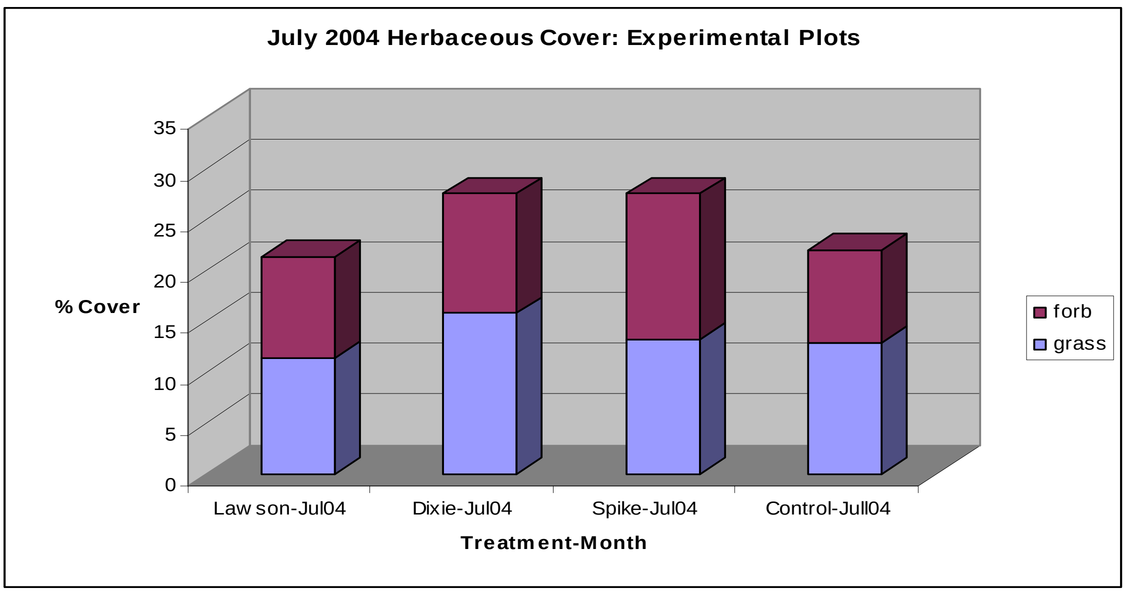

Figure 4. July 2004 herbaceous response in treatments was still higher than controls.

Dixie Harrow

The Dixie Harrow treatment was completed in October 2001. In June and July 2002, researchers collected the first year post-treatment data using the point-intercept sampling technique. Due to the extremely dry year, there appeared to be little understory growth in any of the plots (control or treatment). Though, in 2002 the Dixie Harrow plots did show a higher percentage of herbaceous understory than the control plots, particularly in July. In June and July 2003, Dixie harrow plots showed the most overall herbaceous response. In 2004 Dixie had a higher response than the controls in both June and July (Figures 3 and 4).

Lawson Aerator

The Lawson aerator treatment was completed in October 2001. In June and July 2002 researchers took the first series of post treatment data using the point-intercept sampling technique. In 2002, the Lawson aerator understory did increase from June to July despite the dry conditions. The increase was significant in comparison to the decrease in understory within the control areas. In June and July 2003, Lawson plots showed overall herbaceous response. In 2004 Lawson plots showed lower response than that of the control plots (Figures 3 and 4).

Sage-grouse Use

Birddog surveys were conducted mid to late July of both 2003 and 2004. The entire plot was covered by the dog in ~1.5 hours. Each plot was surveyed twice both years. Grouse were flushed and classified as chick, hen, male, or unknown. Broods were counted as a hen with any number of chicks. If more than one hen flushed with multiple chicks, the number of broods equaled the number of hens.

Birddog surveys indicated differential selection by sage-grouse with all treatments being preferred over the controls. Specifically, the Spike treatments were preferred over the other treatment types (Figure 5). The broods also preferred the treatment areas (Figure 6). Vegetation within the Spike areas differed from the other treatment types. This difference is still being analyzed.

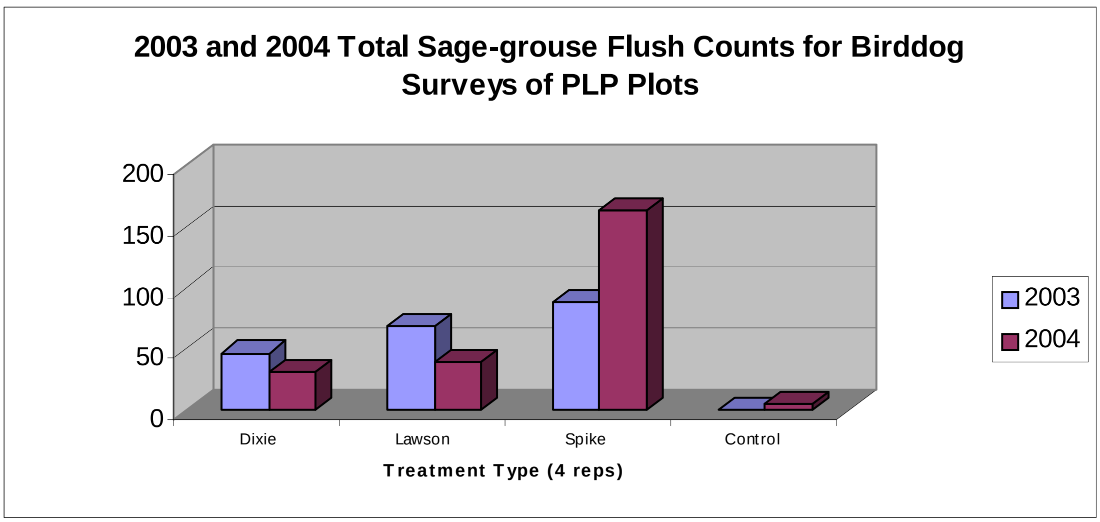

Figure 5.

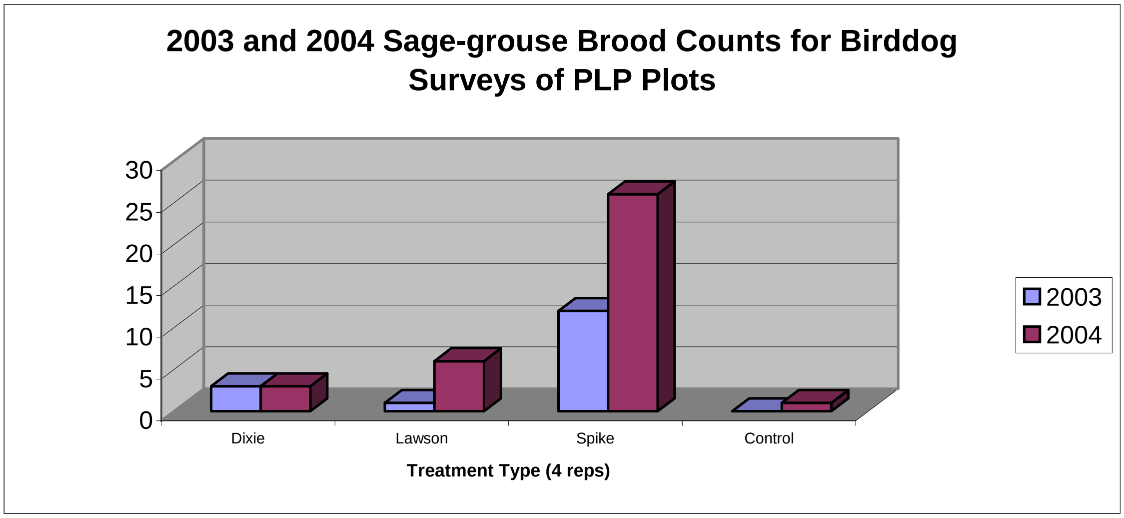

Figure 6.

In August of 2003 and 2004 each plot in the PLP was surveyed for sage-grouse pellets. Each plot was randomly assigned three transects, each within one-third of the plot. Transects were walked slowly while researchers recorded number of pellets (including cecal droppings), distance of pellets to centerline (meters), estimated distance of pellet to edge of habitat type (meters), and habitat type the pellet was found in. The edge of habitat was determined by a change in species of dominant shrub, or abrupt change like edge of a treated area or a road. Roost piles were counted separately, but equal one pellet occurrence within this analysis.

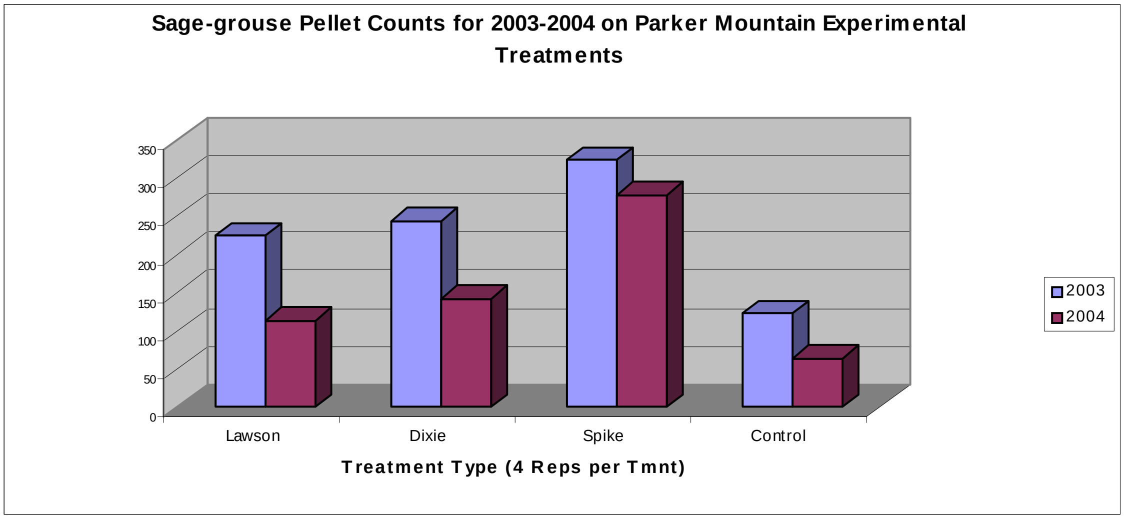

Figure 7.

Total pellet counts for 2003 and 2004 showed a preference by sage-grouse for treatment areas (Figure 7). The Spike treatment was preferred above all other treated areas. Data was fairly consistent over both years. Total pellets counted in 2004 were less than 2003. This is not necessarily indicative of less total grouse in the area, but may be due to more rain during this summer and thus more decomposition.

The distance to edge of habitat data for pellet counts can help indicate the preferences of sage-grouse for treated areas. If the assumption is made that sage-grouse pellet location is associated with use preference, then these data could be used as guidelines for future treatments of mountain big sagebrush in brood-rearing areas on Parker Mountain. Table 2 shows the average estimated pellet distance to edge of habitat by treatment and total for each habitat type and for all habitats combined.

Table 2. Sage-grouse pellet average distance to edge of habitat data (meters)

		ARNO	ARTR	TMNT	TOTAL
Control	Mean	29	18	n/a	21
	Median	23	15	n/a	15
	Stdev	19	24	n/a	23
Dixie	Mean	46	13	12	20
	Median	50	6	10	12
	Stdev	21	15	9	20
Lawson	Mean	49	18	40	34
	Median	40	15	40	30
	Stdev	33	13	23	27
Spike	Mean	47	17	21	25
	Median	50	12	20	19
	Stdev	35	20	14	24

ARNO is Black sagebrush
ARTR is intact mountain big sagebrush
TMNT is treatment

Sage-grouse pellets were found in black sagebrush (*A. nova*), mountain big sagebrush, silver sagebrush (*A. cana*), aspen (*Populus tremuloides*), and treatment areas. Only Black sagebrush, big sagebrush, and treatment areas were reported in Table 2 because we were not able to cover a similar area in silver sage and aspen in PLP.

Sage-grouse were generally close (<20m) to the edge on average while in mountain big sagebrush habitat and while in treated areas in Dixie harrow plots (Table 2). Dixie harrow treated areas exhibited less canopy cover in the first few years post treatment. This may explain the grouse's preference for edge in Dixie harrow plots.

Lawson aerator treatments had pellets much farther away from the edge within the treated areas (Table 2). Lawson aerator treatment left more sagebrush canopy post treatment. The treatment had more of a crushing effect leaving some sagebrush plants still alive. This may provide more cover for sage-grouse and may be the reason they would venture farther from the edge.

Figures 8, 9, 10, and 11 show the frequency of the distance to edge of pellets within mountain big sagebrush areas in Dixie harrow and Lawson aerator treatment plots. These data may help guide managers to a reasonable treatment design for sage-grouse in brood rearing habitat on Parker Mountain. The frequency data shown in the histograms may be of more use in determining distance to edge for treatments than the means as it shows the distance where sage-grouse frequency of use decreases dramatically. Recommendations for treatment width and untreated width by averaged data and by frequency data are in Table 3.

Table 3. Recommendations for creating distance to edge with Dixie harrow or Lawson aerator in mountain big sagebrush treatments in sage-grouse brood-rearing habitat.

	*By Averaged data (Table 2)		**By Frequency data (Fig 4-7)	
	ARTR	TMNT	ARTR	TMNT
Dixie	50m	40m	40-60m	40-60m
Lawson	60m	120m	60-80m	160m+

ARTR-width of intact mountain big sagebrush
TMNT-width of treatment
* standard deviation was added to the mean, then that value was doubled (Table2)
** histograms (Figures 4-7) determined where the frequency of pellets declined dramatically at 10m increments

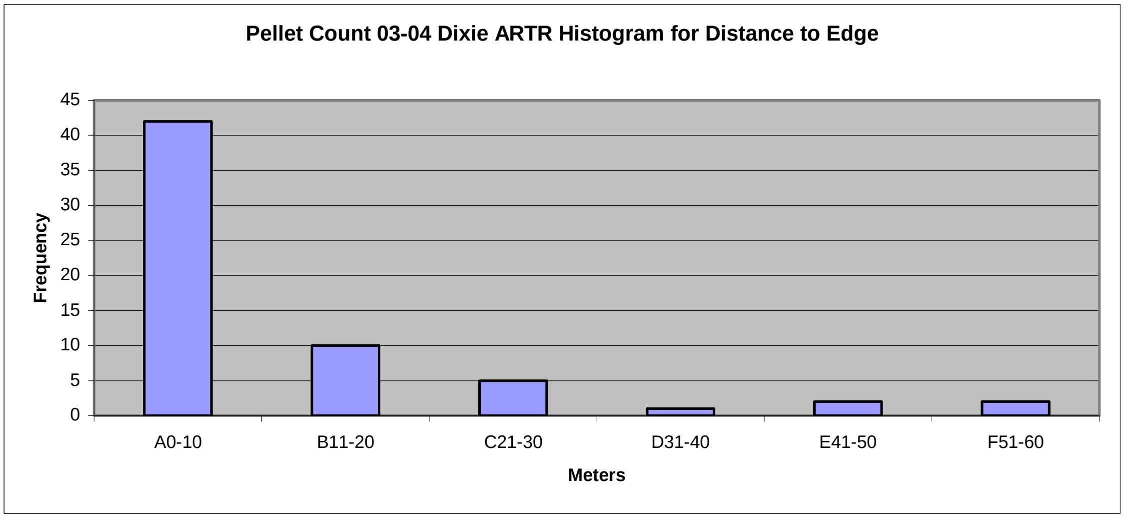

Figure 8.

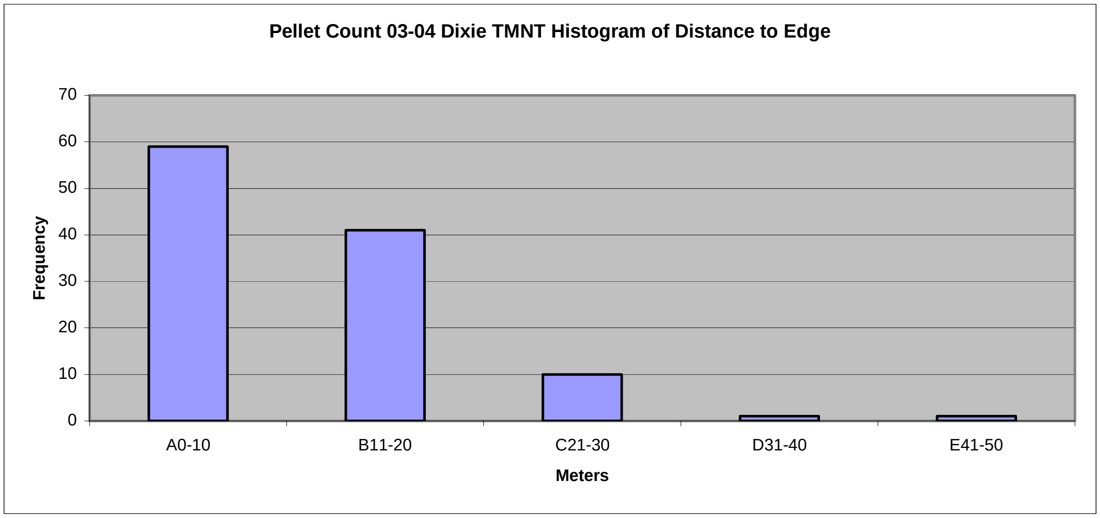

Figure 9.

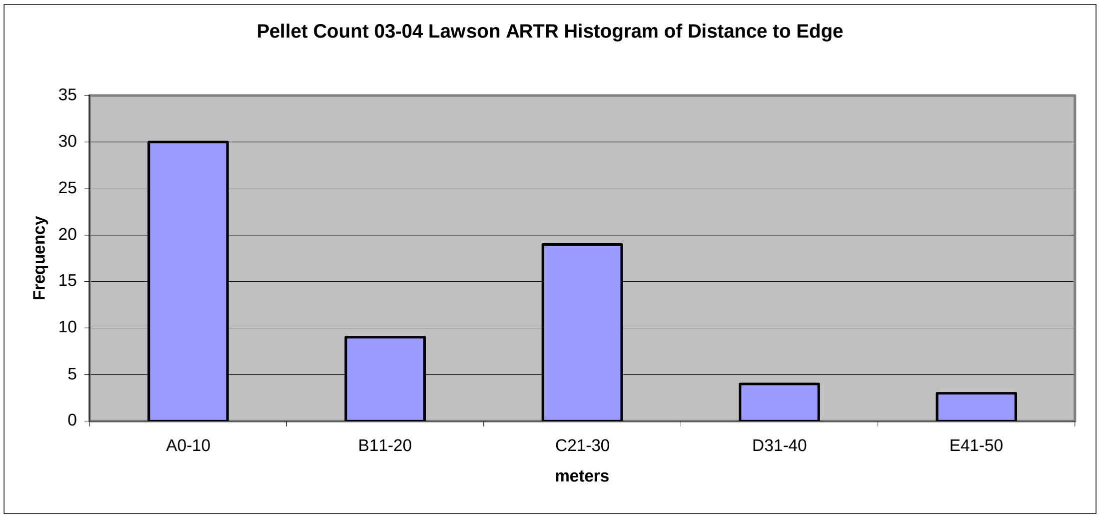

Figure 10.

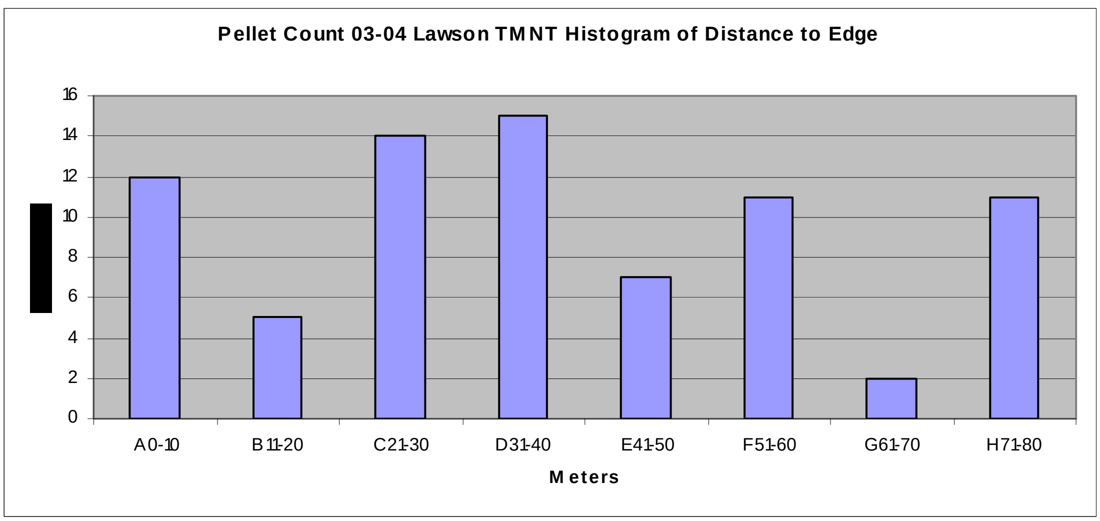

Figure 11.

Spike plots showed sage-grouse using areas closer to the edge (<20m) as well. If the same guidelines for Spike data as the mechanical treatments are followed, these areas should be no more than 70 meters wide with 70 meters of untreated mountain big sagebrush in between. The frequency data for Spike areas would suggest 20-30 meters of big sagebrush be left with 40-50 meters treated (Figures 12 and 13).

Spike areas need to be assessed differently. Spike treated areas leave “skeleton” sagebrush plant when completed. These “skeletons” may still provide cover for sage-grouse, although would not be considered shrub canopy. Many of the Spike treated areas in PLP had only a partial kill of the mountain big sagebrush. This would be the most desirable, as it would provide cover while still providing a treatment response from the herbaceous component. This may be one of the reasons sage-grouse preferred Spike treated areas in PLP.

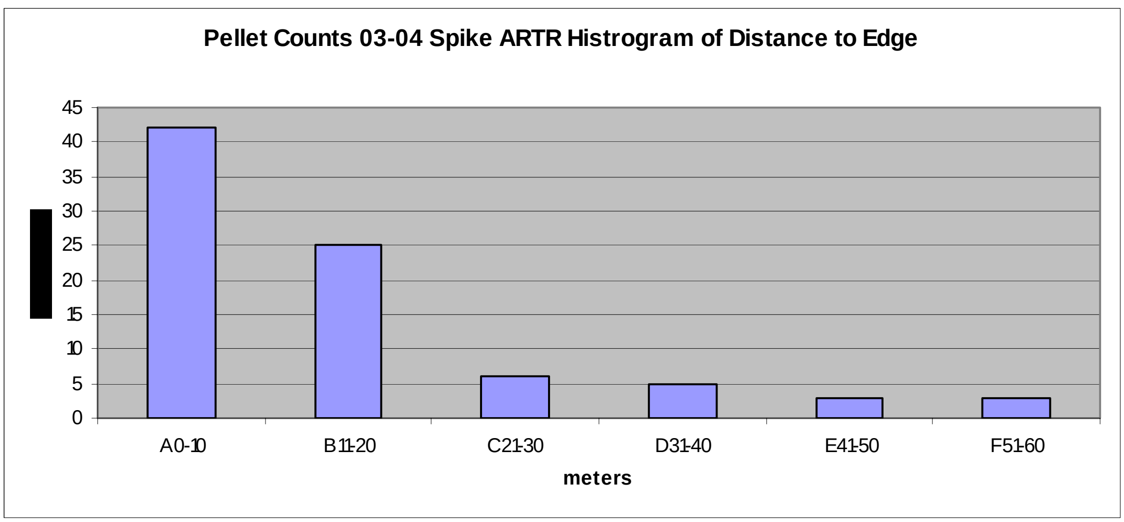

Figure 12.

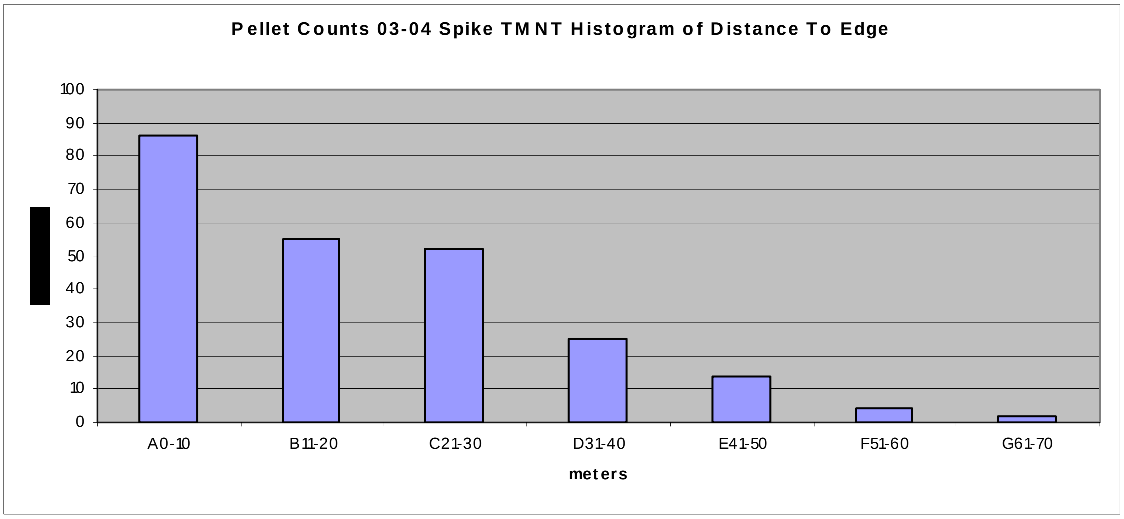

Figure 13.

Interestingly, in the control areas, the grouse were still using mountain big sagebrush habitat within <20 m of the edge, though the standard deviation was greater (Table 2). This also helps in determining the sage-grouse's preference for habitat, even though the area has not been treated. Frequency data shows a decline in pellets after 20 m from edge and almost none after 40 m from edge in control plots (Figure 14).

Most of the pellets found in black sagebrush were roost piles. Sage-grouse prefer to roost in these shorter shrub areas. They are an important component of sage-grouse habitat, and occur on the side hills and hill tops in the PLP and through most of the Parker Mountain area. Black sagebrush is not a target species for treatment in the Parker Mountain area. Sage-grouse on Parker Mountain are using treated areas for brood-rearing and other habitat requirements. This preference for treated areas over control sites may be because of the increased herbaceous cover. However, even in the treated areas, they still preferred the edge of the treatments where intact sagebrush cover was still available. This information should be further validated by other studies at different elevations.

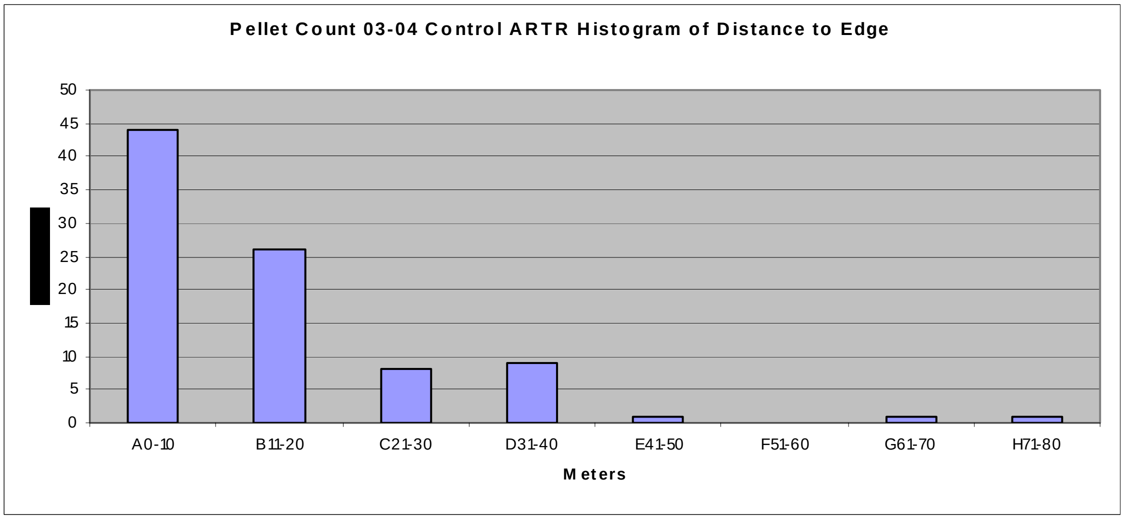

Figure 14.

Sage-grouse on Parker Mountain are using treated areas for brood-rearing and other habitat requirements. They may prefer treated areas to other areas due to the increase in herbaceous cover, though they seem to prefer the edge of treatments where intact sagebrush cover is available. In the future managers can use this information to help guide their efforts for sage-grouse conservation as they conduct habitat treatments. A mosaic of different aged stands of sagebrush is probably most desirable in brood-rearing habitats on Parker Mountain. More sinuous treatment designs with treatment width following the above guidelines when using the Dixie harrow or Lawson aerator would create more edge habitat, and may be better for sage-grouse using the area.

Based on this research, we believe a mosaic of different-aged stands of sagebrush is probably most desirable in brood-rearing habitats on Parker Mountain. More sinuous treatment designs with treatment width following the above guidelines when using the

Dixie harrow or Lawson aerator would create more edge habitat, and may be better for sage-grouse using the area.

The PLP treatments were completed on a small scale in a vast expanse of sagebrush habitat. Additional research may be needed to document the effect of large scale treatment. However, our work seems to suggest that the use of small treatments within a large-scale area of continuous sagebrush habitat may create resource patches which are particularly attractive to broods. These treatments sites were selected because they were within known brood-rearing habitat that was receiving little documented use. Habitat selection of specific areas by the local sage-grouse population needs to be identified before implementing such treatments.

As the vegetation matures in the treated areas, sage-grouse may switch their preference of treatment type over time. With PARM's support, sage-grouse use data on Parker Mountain will continue to be collected and analyzed along with vegetation data to help researchers and managers better conserve sage-grouse on Parker Mountain.

Rabbit Exclosures

The rabbit exclosures exhibited some interesting results in 2002. Herbaceous understory abundance data collected from June to September suggests rabbits may be having an impact on forage production in the treatment area. August seems to be the period when rabbit herbivory is most significant.

In 2004, we used the same techniques to monitor vegetation responses that were used in the previous 2 years. Rabbit transects were run each month during the summer to assess rabbit population trend within PLP. Our preliminary data suggests that the rabbits may be removing up to 20% of the treatment response in some plots.

Sage-grouse Transplant to Strawberry Valley

In late March and April 2004, we worked with the UDWR and researchers from Brigham Young University (BYU) to transplant sage-grouse hens from Parker Mountain to Strawberry Valley in north central Utah. Thirty-five hens were moved within three or four trapping nights. Birds were transferred immediately from capture site to release site the following morning. Hens were released near the main lek in Strawberry Valley to increase the likelihood of Parker birds inter mingling with Strawberry birds. All hens were radio-collared and followed through the summer and data will continue to be collected into 2005. The same transplant is scheduled for the spring of 2005. Preliminary data has shown the transplant to be successful.

Cattle Grazing and Utah Prairie Dog Interactions on Parker Mountain

Introduction

The Utah prairie dog (*Cynomys parvidens*) belongs to the whitetail subgenera (Leucocrossuromys) of prairie dogs and is found in arid grasslands and sagebrush steppes in southwestern Utah. Historically, there were an estimated 95,000 Utah prairie dogs prior to control in the 1920's (McDonald 1993). Large-scale human induced habitat changes, drought, and disease [most notable plague (*Yersinia pestis*)], resulted in considerable reduction in prairie dog numbers. The species was listed as an endangered species in 1973 pursuant to the Endangered Species Conservation Act of 1969, but was down-listed to threatened in 1984 after substantial numbers were found to be doing well on private lands in parts of Utah.

A long term Utah prairie dog recovery plan was initiated by the U.S. Fish and Wildlife Service in 1991 in an effort to achieve and sustain viable populations on public lands in three target areas (USFWS 1991). The areas of concern are the West Desert of Utah, the Paunsaugunt Plateau, and the Awapa Plateau.

The dominant land use activity across most of the range of the Utah prairie dog is grazing by domestic livestock (increasingly cattle). This is true on both private and public land holdings. Therefore, it is necessary to fully understand the potential impacts that grazing might have on the plant community and thus on the Utah prairie dog. It is not expected that cattle will disappear from the landscape any time soon. Therefore, the future of the Utah prairie dog depends on identifying grazing practices which allow it to not only survive but to maintain itself in viable populations.

We are currently evaluating the effect of grazing by cattle on the plant community in a sagebrush steppe ecosystem which is occupied by several Utah prairie dog colonies. We have constructed nine pastures of equal size (8.1 ha or 20 acres) and randomly assigned treatments to the pastures (Figure 15). There are three treatment levels (grazing intensities) and three replicate pastures for each treatment level. Specific grazing intensities are current forage utilization (50-60%), 20-30% forage utilization, and 80-90% forage utilization. These grazing intensities are being met by stocking the appropriate number of cow/calf pairs (of approximately equal weights) and monitoring each pasture against control exclosures to measure utilization as closely as possible. Vegetation characteristics are being measured before grazing, immediately after grazing, and one month after grazing for three field seasons. Specific vegetation characteristics being measured are presence, height, and percent ground cover for each species along random transects within the pastures. More thorough description is found in the methods section

Study Area and Site Description

The Parker Mountain Resource Area is located in portions of Garfield, Piute, and Wayne Counties in south central Utah on the Awapa Plateau. It is bounded to the north by the Fish Lake Mountains, to the west by the escarpment of the Parker Mountains, to the east by Rabbit Valley, and to the south by the Escalante and Boulder Mountains. A total of 105,171 ha is managed by the U.S. Forest Service, Bureau of Land Management, School and Institutional Trust Lands Administration (SITLA), and limited private in holdings. The area is composed of rolling topography dominated by sagebrush with scattered patches of aspen (*Populus tremuloides*). Mountain big sagebrush (*Artemisia tridentate* ssp. *vaseyana*) and black sagebrush (*Artemisia nova*) are present with limited amounts of silver sagebrush (*Artemisia cana*). Parent material for Parker Mountain is composed mostly of volcanic deposits. Soils in this area are generally loamy, rocky, and well-drained. It should be noted that well-drained soils are essential for prairie dog burrows (Collier 1975). Elevation varies from 7,200 feet to 9,800 feet. Parker Mountain receives 16-20 inches of precipitation annually, with most occurring in late summer (monsoon pattern) and during the dormant season as snow (Jaynes 1982).

The specific area for this proposed experiment is located on SITLA land near the junction of Garfield, Piute, and Wayne counties, and us commonly known as the tanks area (Figure 16). This area is dominated by black sagebrush. Soils on the ridges are Forsey series and the swales are composed of Parkay series (Jaynes 1982).

The dominant land use activity on Parker Mountain is grazing by domestic livestock. Historically both sheep and cattle were grazed on Parker, with a long history of abuse of range (Jaynes 1982) which resulted in large areas composed almost entirely of sagebrush with few grass and forb species. The resultant decline in range productivity resulted in massive sagebrush removal attempts which continue at present. Range condition on Parker has greatly improved in recent years. A healthy population of pronghorn antelope (*Antilocapra americana*) is present with as many as 150 animals removed every year for translocation to areas both inside and outside the state. Additionally, sage grouse numbers appear to be responding well to current management activities. Utah prairie dogs inhabit several colony sites across Parker Mountain, although the numbers have declined in recent years, partially due to drought conditions (unpublished Utah Division of Wildlife Resources data).

Due to market conditions resulting in declining profitability of sheep production, there continues to be a trend towards increasing cattle grazing and decreasing sheep grazing on Parker Mountain. We expect this trend to continue into the foreseeable future, and therefore are evaluating only cattle grazing and not sheep in this experiment.

There are several Utah prairie dog colonies in the vicinity (within several miles) of the tanks treatment site. A large colony is located to the north and to the south of the treatment site. Selection of the site for the pastures was partially based on this fact so that prairie dog response to treatment could be evaluated over the long term. Additionally, we wished to control for as much environmental variation as possible. The proposed location has similar soil and elevation. By locating all pastures together we also hope to eliminate the effect of microclimate (specifically precipitation) differences which can be drastic in an environment of monsoonal rain patterns. Locating the pastures together was also necessary for logistical reasons which will be elucidated in the methods section.

Methods

Nine pastures of equal size (8.1 ha or 20 acres) were constructed in a drainage area located in the tanks area of Parker Mountain during 2003 (Figure 15). Fence construction was done on contract through Utah State University using existing fence where possible. Two 2.500 gallon water tanks were placed on the highest elevation of the pastures and a network of PVC pipe was installed. Each pasture has a smaller water tank (apx. 100 gallons) which is supplied by the 2,500 gallon tanks via pipes.

Three treatment levels are under being used. They are current forage utilization (50-60%), 20-30% forage utilization, and 80-90% forage utilization. Each of the pastures had a treatment randomly assigned under an elevational stratification. It was not possible to locate the study site in a completely level area. Therefore some pastures are on a slightly higher elevation. We expect differences in vegetation due to differences in soil and water levels along the elevational gradient. The pastures were therefore stratified into ridge and swale sites. Pastures one, three, five, six, and nine were classified as ridge sites. Pastures two, four, seven, and eight, were classified as swale sites (Figure 15). The randomization specified that each treatment must be represented in both site types. This was an attempt to control for slope position.

Two exclosures were also constructed in each pasture so that forage utilization can be monitored. Exclosure size is 5 x 5 m. Each pasture was divided into 4 equal quadrants. Within each quadrant five transects 25 m. in length are randomly located for each vegetation survey period. The beginning point and the direction of the transect are random such that the transect does not cross over a pasture boundary. Vegetation measurements are taken at 5 m. intervals along the transect. At each interval a Daubenmire frame is used to evaluate species present, percentage of ground occupied by each species, and plant height (Daubenmire 1959). Additionally, line intercept is utilized to evaluate shrub abundance along the transects (10 m only). Vegetation measurement will be taken immediately before treatment, immediately after treatment, and in late summer for three field seasons. Daubenmire frames and line intercept are also being used in each exclosure and paired unenclosed plots to evaluate the effect of grazing intensity. Cattle are placed on the pastures simultaneously in early June and removed when the assigned forage utilization levels are met. Cattle are being leased from members of the grazing association on Parker Mountain.

In an attempt to evaluate the effect of prairie dog burrows on the vegetation community of Parker Mountain, micro-site vegetation characteristics of prairie dog burrows (both active and inactive) were evaluated during 2004 to compare with random micro-sites using similar vegetation measurement techniques as listed above.

Vegetation Analysis

We are interested in the change in vegetation composition and structure over time in response to varying intensities of cattle grazing. Gradients of interest are therefore time and treatment. Twenty transects are sampled within each of the nine pastures each year prior to grazing, immediately following grazing, and at the end of the growing season. Measurements taken along each transect will be averaged such that each transect will have one response for each measurement of interest.

Vegetation characteristics to be measured include plant height, percent ground cover of each plant, and species present. Plant height is important due to visual obstructions which allow predation on prairie dogs. It can deter prairie dog utilization of habitat (Crocker-Bedford 1975). For analysis purposes plant species will be divided into suitable or unsuitable in terms of prairie dog conservation. In general, grasses and forbs will be classified as suitable while shrubs will be classified as unsuitable. The average number of suitable and unsuitable plants present and average percent composition of suitable and unsuitable plants will be calculated for each transect. Additionally, Shannon Weaver indices will be calculated for each transect to examine species diversity (Peet 1974). Transect data and mound vegetation data will be tested for normality and analyzed using the appropriate tests (likely ANOVA). Exclosure data will be examined using PROC MIXED in SAS due to the repeated measures aspect (SAS 1999).

Prairie Dog Monitoring

Additionally, at the beginning of the study, the locations of any historic prairie dog burrows within the experimental pastures were recorded with Global Positioning System (GPS) (Figure 17). Throughout the study any new burrow construction or occupation of historic burrows are being noted and the locations recorded (Figure 18). If sufficient movement within the experimental pastures occurs during the study, Analysis of Variance (ANOVA) will be used to test for differences between treatment levels (assuming normality). Weekly prairie dog counts are also conducted in each pasture for the same purpose (Figures 19 and 20). During 2004 we additionally conducted weekly forage observations in each treatment level to examine differences in time allocation between treatment levels for adult (Figures 21, 22, and 23) and juvenile (Figures 24, 25, and 26) prairie dogs.

We further propose to capture and mark at least 30 Utah prairie dogs within the experimental pastures during 2005. Those marked individuals will be recaptured at the end of the summer to evaluate weight gain differences for adult and juvenile prairie dogs between treatment levels (i.e. forage utilization levels). Complete results with management implications for all research will be available in 2006.

Management Implications

Once the three years of vegetation data are analyzed, specific interpretation can be made regarding the effect of varying grazing intensities on the Utah prairie dog based on knowledge of habitat requirements. This information should prove useful not only to the wildlife manager interested in prairie dog management but also to the land manager or rancher in managing livestock in ways that allow coexistence with the prairie dogs. Thus the rancher will be ensuring his own future on the land (particularly public land). Due to the elevation of the proposed study site, a limited grazing season exists. In the past cattle have been grazed for the entire growing season but at low stocking rates. In many areas this has lead to increased shrub and decreased grass and forb abundance. By stocking at higher rates for a shorter duration, it is anticipated that the plant community can be manipulated to be more beneficial to the Utah prairie dog. By examining this hypothesis on a small controlled scale, we hope to identify more appropriate grazing strategies for Parker Mountain that will be of benefit to the Utah prairie dog and the ranchers.

This endeavor will only be successful with input and participation of ranchers within the historic range of the Utah prairie dog. By involving communities in research planning, many misunderstandings and stumbling blocks can be eliminated. The Parker Mountain grazing association has had constant input into this project and will be encouraged to continue to do so.

The Utah prairie dog is dependent on many vegetation characteristics which can be maintained with proper grazing management. Thus, the future of this species must involve those on the land after a proper knowledge of the effect of grazing on vegetation in prairie dog range is more clearly understood.

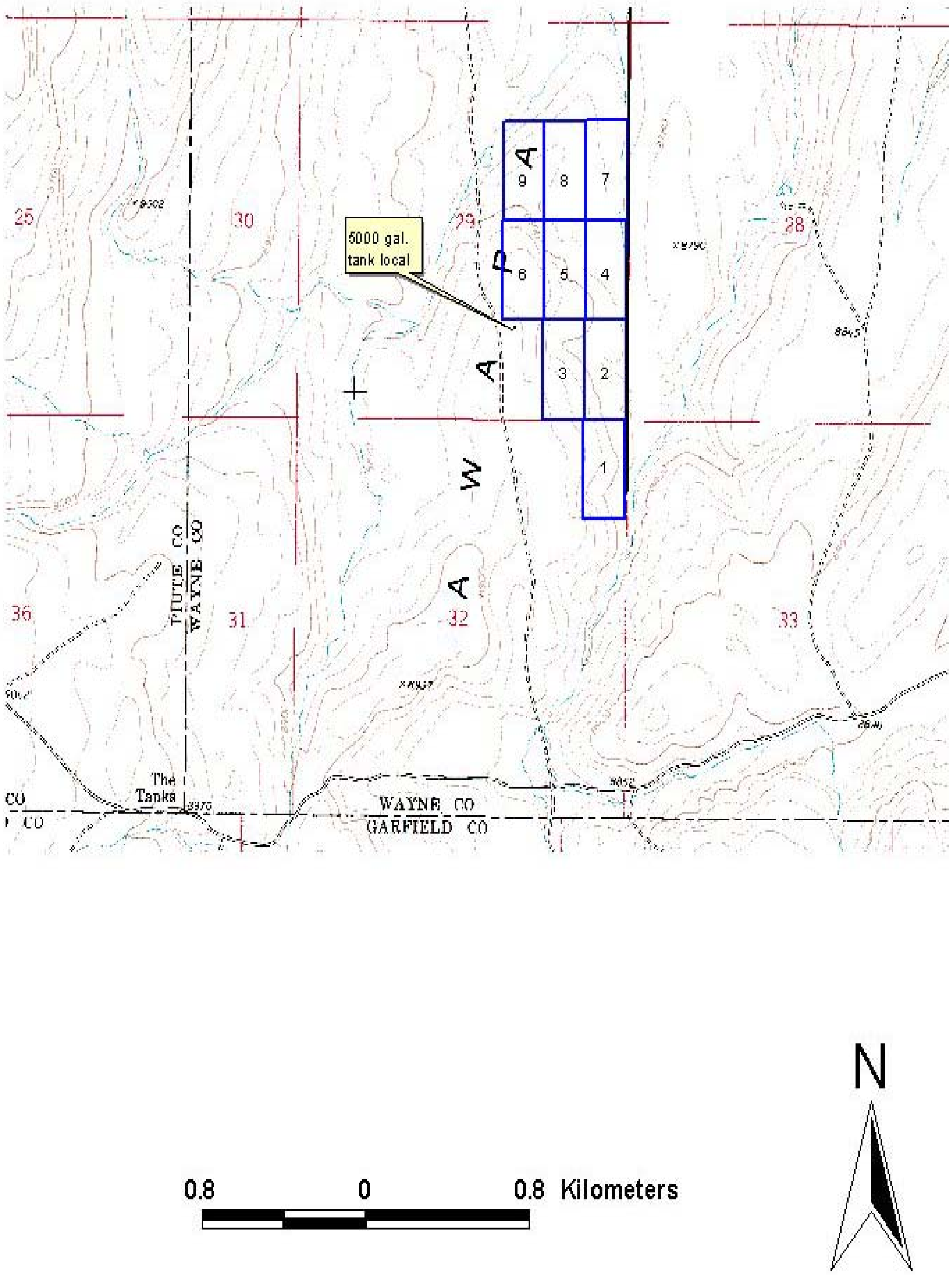

Figure 15. Experimental pasture locations and water tank location on Parker Mountain, Utah.

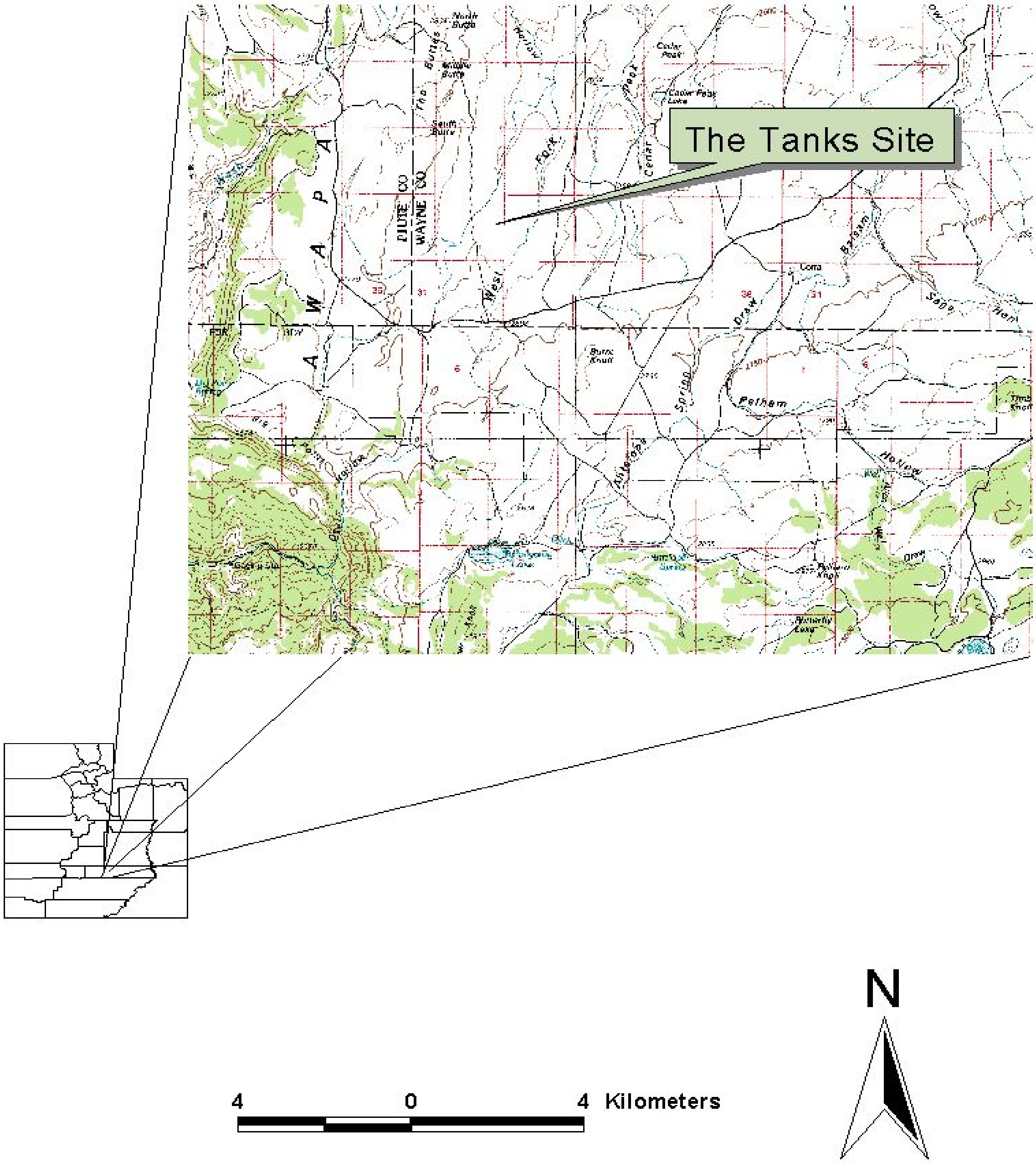

Figure 16. Location of proposed experimental grazing experiment on Parker Mountain, Utah.

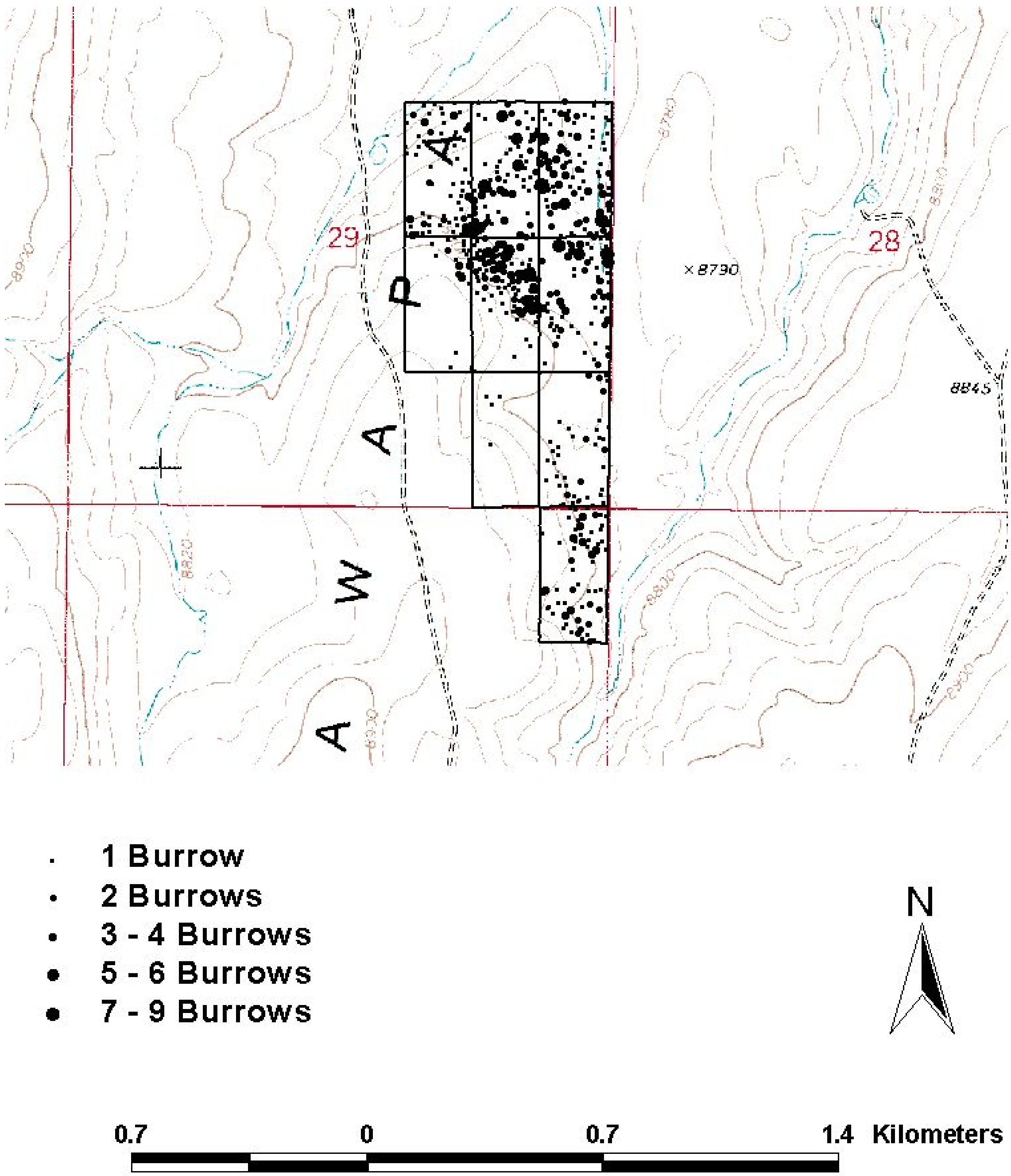

Figure 17. Prairie dog burrows in experimental treatment pastures for 2003.

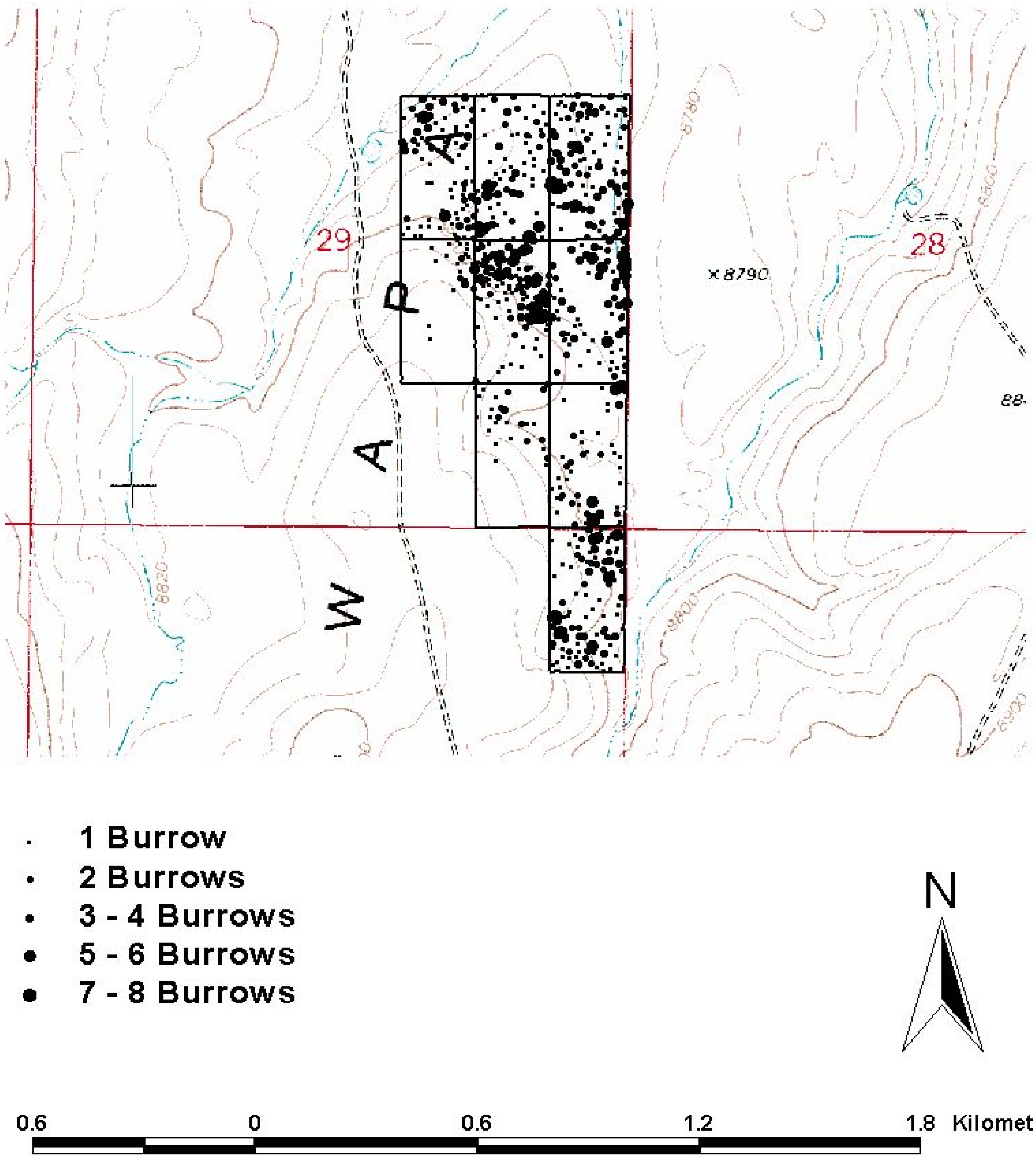

Figure 18. Prairie dog burrows in experimental treatment pastures for 2004.

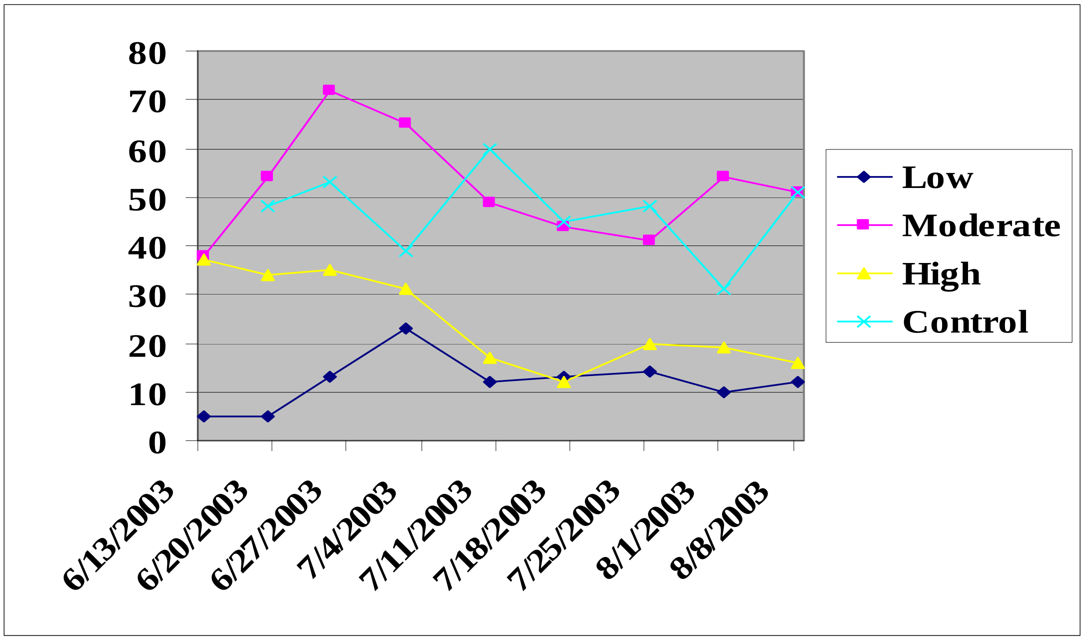

Figure 19. Prairie dog counts in experimental pastures for 2003 sorted by forage utilization level.

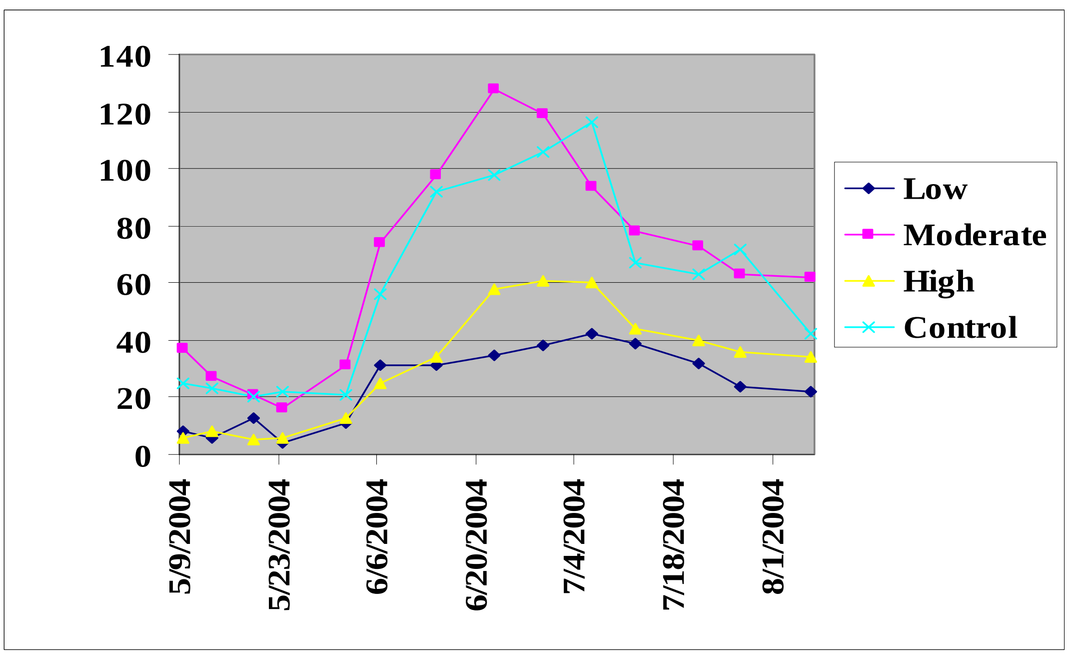

Figure 20. Prairie dog counts in experimental pastures for 2004 sorted by forage utilization level.

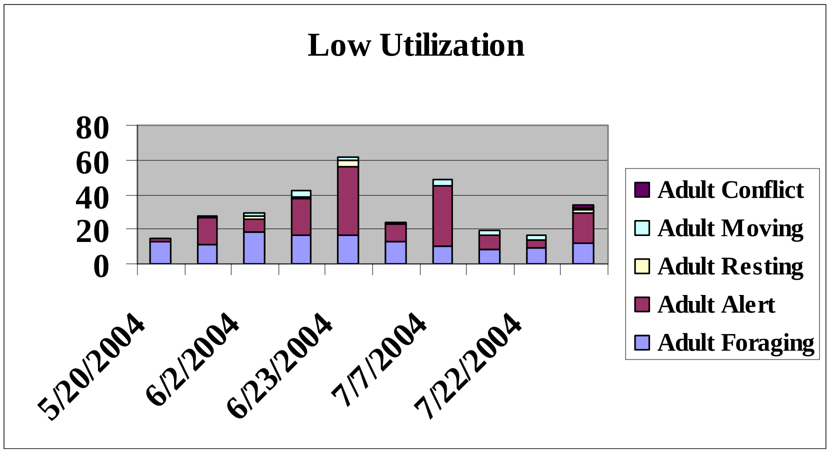

Figure 21. Activity of adult prairie dogs in low forage utilization pastures for 2004.

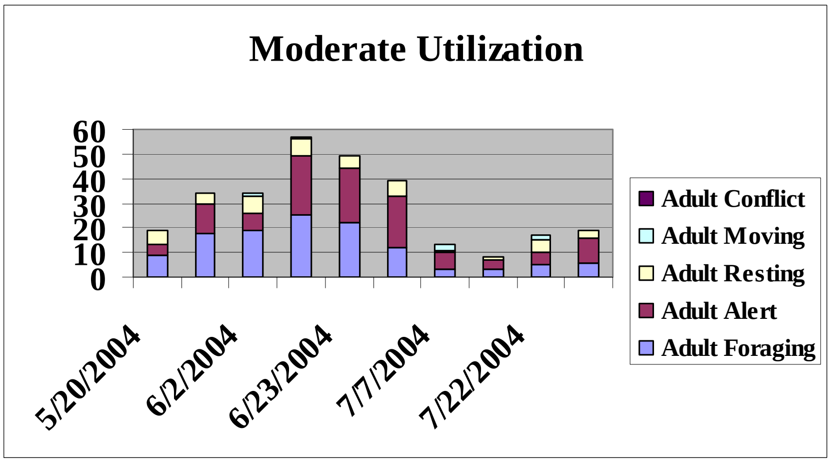

Figure 22. Activity of adult prairie dogs in moderate forage utilization pastures for 2004.

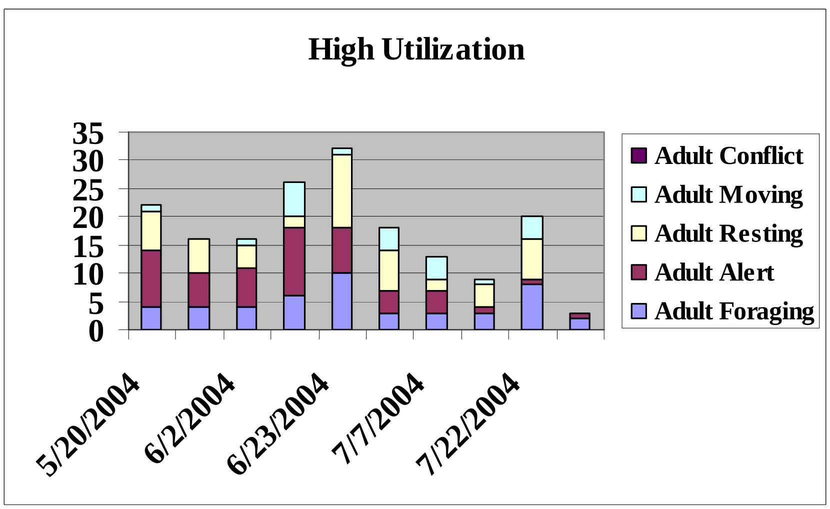

Figure 23. Activity of adult prairie dogs in high forage utilization pastures for 2004.

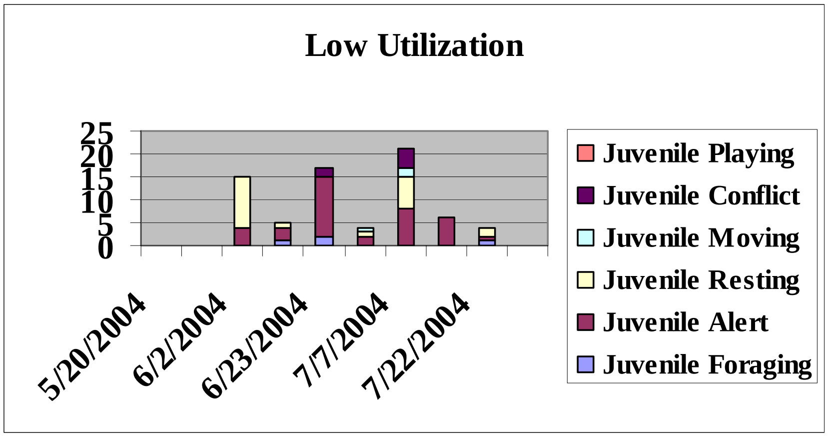

Figure 24. Activity of juvenile prairie dogs in low forage utilization pastures for 2004.

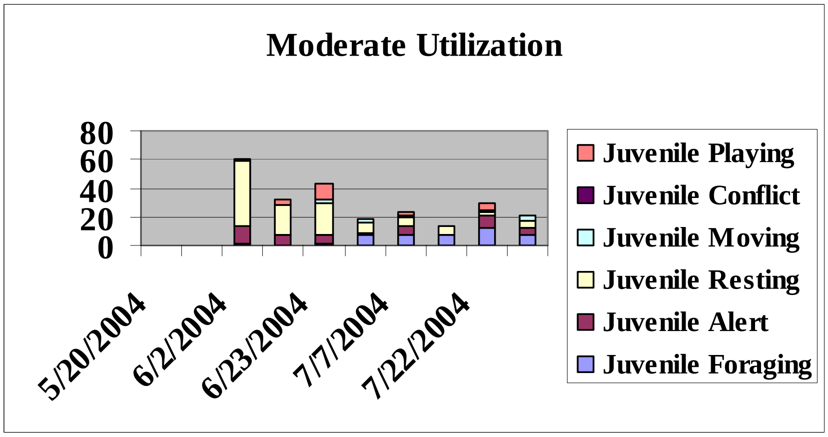

Figure 25. Activity of juvenile prairie dogs in moderate forage utilization pastures for 2004.

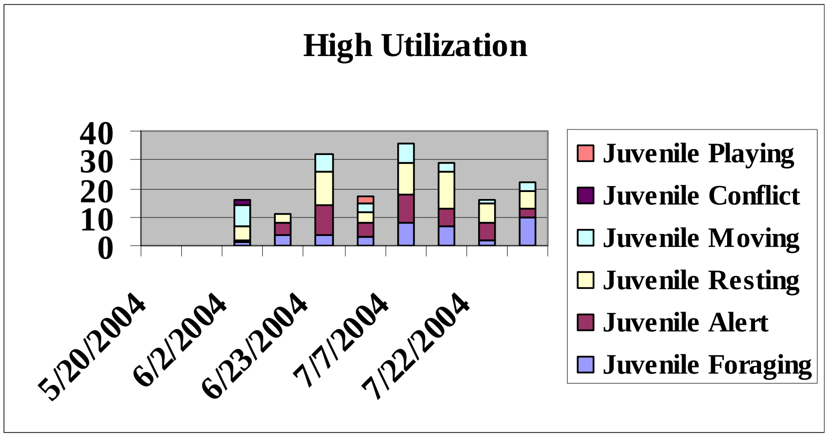

Figure 26. Activity of juvenile prairie dogs in high forage utilization pastures for 2004.

Utah Prairie Dog Mitigation Bank

A draft habitat conservation plan for two prairie dog mitigation bank areas on Parker Mountain has been prepared by Joel Flory and a final plan is expected in early 2005.

The one mitigation bank site at Flossie Lake is approximately 254 acres. It has been fenced, Dixie harrowed, and seeded in 2002. Some of the seeding has been successful, but most of the herbaceous plants coming in on the site are native species. The sagebrush control was successful as canopy covers were reduced below 2 percent. Future sagebrush control to maintain good prairie dog habitat will need to be implemented within the next 5-10 years as sagebrush seedlings become established. The vegetation is well enough established that the fences may be able to be removed to provide better cattle movement through this area. No prairie dogs are at this site yet. This site will most likely have prairie dogs transplanted to this area for a population start.

The mitigation site near the Tanks is 222 acres. It currently has prairie dogs that are widely dispersed. The Tanks site is also providing research opportunities to study how different cattle grazing regimes affect prairie dog numbers and dispersal behavior. This site also provides great opportunities for expansion and dispersal of prairie dogs to adjacent areas containing good habitat.

Conclusions

The Sage-grouse population on Parker Mountain appears to have natural fluctuation. This year there was a slight decrease in lek counts, although lek count numbers were relatively high in comparison to historical lek counts. Greater population increases in subsequent years should be expected in response to the vegetation treatments in Parker Lake Pasture and other treatments that will be implemented in subsequent years. Our measurements of sage-grouse use are important monitoring activities. For the second year post treatment, sage-grouse seem to prefer treated plots over control plots. The vegetation community and structure will continue to change following treatment. Sage-grouse use patterns within these plots will be interesting to monitor.

Nest initiation was lower than most years, though sample size was very low in 2004. Nest initiation dates for this year were slightly later than last year. Nest predation was fairly significant this year. The average clutch size was similar to previous years (six-seven eggs/nest). Nest success was 80 %, comparatively high. Hen movement was similar to previous years.

The response of the sagebrush to the tebuthiuron treatments was significant, specifically for more succulent forbs like dandelion. The forb response to tebuthiuron recorded in the Parker Lake pasture is particularly significant. Additionally, the forage value of these forbs to the sage-grouse broods is critical, especially in dryer years.

Sage-grouse use patterns this year were interesting. Along with analyzing vegetation diversity, documenting sage-grouse use post treatment will be important to assessing treatment effectiveness. During the second year for Dixie and Lawson post treatment, and the third year for tebuthiuron post treatment, grouse seem to prefer the tebuthiuron treated areas. Timing, precipitation, and other factors may be contributing to habitat selection by sage-grouse. Future data will help in assessing sage-grouse use preferences.

According to data taken, rabbit herbivory seems to impact vegetation response to treatments. The data collected in Parker Lake Pasture will be important to understanding plant/herbivore interaction, specifically rabbits and herbaceous understory in sagebrush ecosystems. Data will continue to be taken through 2005.

Prairie dog interactions with cattle grazing has showed some interesting results so far. Utilization levels have been achieved with a high intensity short duration grazing regime. Research will continue with grazing and the monitoring of prairie dogs. Proposed research will continue to take place in the future.

Literature Cited

Collier, G. D. 1975. The Utah prairie dog: abundance, distribution, and habitat requirements. Pub. No. 75-10. Utah Division of Wildlife Resources. Salt Lake City, UT. 94 pp.

Crocker-Bedford, D. 1975. Utah prairie dog habitat evaluation. Proc. Utah Wildl. Tech. Mtg. 7 pp.

Daubenmire, R. F. 1959. A canopy coverage method of vegetational analysis. Northwest Sci. 33:43-64.

Jaynes, R. A. 1982. Inventory and analysis of rangeland resources of the state land block on Parker Mountain, Utah. Center for Remote Sensing and Cartography, Report 82-6. Salt Lake City, UT.

McDonald, K. P. 1993. Analysis of the Utah prairie dog recovery program, 1972-1992. Publication No. 93-16, Utah Division of Wildlife Resources. Cedar City, UT.

Peet, R. K. 1974. The measurement of species diversity. Ann. Rev. Ecol. Syst. 5:285-307.

SAS Institute, Inc. 1999. SAS/STAT user’s guide, Release 8.2 edition. Cary, North Carolina, USA.

U. S. Fish and Wildlife Service (USFWS). 1991. Utah prairie dog recovery plan. U. S. Fish and Wildlife Service. Denver, CO.

Appendix A

Summary of Biological Information:

2004's sample size is very low (n=9) and may not be representative of the population at large

I. Lek Counts

	1998	>273 males
	1999	>350 males, up>25%
	2000	>350 males, still up but down slightly from 1999
	2001	>450 males, up ~20% from 2000
	2002	>550 males, up ~15% from 2001
	2003	>413 males, down 25% from 2002
	2004	**>541 males, up 32% from 2003**

II. Nest Initiation

	Y	A	
1998	8/19	8/9	(57%)
1999	6/16	16/17	(67%)
2000	* 13/26		(50%)
2001	* 17/25		(68%)
2002	* 19/26		(79%)
2003	* 18/19		(95%)
2004	*** 5/9**		**(56%)**

* Denotes combined yearling and adult data

III. Nest Predation

1998	3/16	(19%)
1999	10/19	(53%)
2000	2/13	(15%)
2001	6/17	(35%)
2002	5/19	(25%)
2003	7/18	(39%)
2004	**1/5**	**(20%)**

IV. Adult Mortality

2000	6/21	(28%) (*by the end of August, only 21 collars were still transmitting)
2001	6/25	(24%)
2002	9/26	(35%)
2003	9/25	(36%)
2004	**1/7**	**(14%)**

Contributions of PARM partners in 2004.

Parker Mountain Grazers Association and Wool Growers	\$3,000.00 – Direct Cost **Total: \$3,000.00**
BLM	\$15,000.00 – Direct Cost **Total: \$15,000.00**
SITLA	\$1,200.00 – Personnel days (8) **Total: \$1,200.00**
Forest Service	\$2,000.00 – Direct Cost \$400.00 – Office Services **Total: \$2,400.00**
NRCS	\$7,350.00 – Direct Cost **Total: \$7,350.00**
UDWR	\$5,000.00 – Direct Cost \$5,000.00 – Vehicle Cost **Total: \$10,000.00**
USU	\$33,200.00 – Personnel Cost ~\$10,000.00 – Vehicle Cost \$3,000.00 – Misc. (Supplies) Cost **Total: \$46,200.00**
	Grand Total: \$85,150.00